



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/518,100	12/15/2004	Andreas Thies	2004-256	5518
27569	7590	08/23/2007		
PAUL AND PAUL 2000 MARKET STREET SUITE 2900 PHILADELPHIA, PA 19103			EXAMINER MENDEZ, ZULMARIAM	
			ART UNIT 1753	PAPER NUMBER
			NOTIFICATION DATE 08/23/2007	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

INFO@PAULANDPAUL.COM
claire@paulandpaul.com
fpanna@paulandpaul.com

Office Action Summary

Application No.

10/518,100

Applicant(s)

THIES ET AL.

Examiner

Zulmariam Mendez

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/15/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
- Paper No(s)/Mail Date See Continuation Sheet.

- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :11/03/2006; /
09/25/2006; 01/06/2005 and 12/15/2004.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, and 3-6 rejected under 35 U.S.C. 102(e) as being anticipated by Mayer et al. (US Patent no. 6,562,204).

With regard to claim 1, Mayer discloses an apparatus for potential controlled electroplating of fine patterns on semiconductor wafers comprising: at least one anode (7) and at least one cathode/wafer (8), at least one reference electrode (6) being disposed at the surface of the at least one anode or at the surface of the at least one cathode (see figure 1), a voltmeter is implied since the reference electrode is used to monitor and control the potential of the wafer (col. 5, lines 7-16) and for detecting the electric voltages between the reference electrode (6) and the cathode (8).

With regard to claims 3 and 4, the reference electrode (6), of the controlled-potential electroplating device of Mayer, consist of a capillary chamber containing a metal electrode. The electrolyte in the reference electrode chamber contains the same

metal ions as the electrolyte in the electrodeposition bath. The capillary chamber have its opening near the wafer and terminates in close proximity to the wafer/cathode (col. 5, lines 53-57 and 63-67).

With regard to claim 5, the anode (7) and the cathode (8), as disclosed by Mayer, are paralleled and oriented horizontally (see figure 1).

With regard to claim 6, the cathode, as taught by Mayer, is a wafer substrate (col. 4, lines 32-37) and the anode is a dimensionally stable metal anode such as a platinum or titanium anode (col. 5, lines 1-6).

3. Claims 7, 8 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Langner et al. (US Patent no. 4,834,842).

With regard to claim 7, Langner discloses a method of monitoring an electrolytic process in an electrolytic cell (1) comprised of at least one anode (6a) and of at least one cathode (6d), two reference electrodes (6b and 6c) being disposed at the surface of the anode and cathode, respectively; voltmeters (AP, CP) being respectively provided for detecting the electric voltages between the anode and one reference electrode (6b) and between another reference electrode (6c, see figure 1) and the cathode, said method involving the following method steps:

- a) providing an electric current with a constant current source (CCS) flow between the at least one anode (6a) and the at least one cathode (6d) by means of contacts (8 and 9, see figure 1),
- b) concurrently detecting the respective electric voltages between the at least one anode (6a) and the at least one reference electrode (6b) and between the at least one

Art Unit: 1753

reference electrode (6c) and the at least one cathode (6d) using metal wires (D1-4, see figure 2; col. 4, lines 15-17).

With regard to claim 8, Langner discloses one first reference electrode (6b), which is disposed at the surface of the anode (6a) and a second reference electrode (6c), disposed at the surface the cathode (6d; see figure 1); including the following partial method steps:

- a) detecting the electric voltage (U_1) between the anode (6a) and the first reference electrode (6b) (see figure 2);
- b) detecting the electric voltage (U_2) between first reference electrode (6b) and the second reference electrode (6c);
- c) detecting the electric voltage (U_3) between the at least one second reference electrode (6c) and the at least one cathode (6d).

With regard to claim 11, the electrodes, as taught by Langner, paralleled and tilted from horizontal by 90° (see figure 1).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1753

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 2-6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mayer as applied above to claim 1, and further in view of Langner et al.

With regard to claim 2, Mayer discloses all of the structure, as applied above to claim 1, wherein one first reference electrode (6) is disposed at the surface of a cathode (8) but fails to teach a second reference electrode disposed at the surface of the anode and wherein a voltmeter is respectively provided for detecting the electric voltages between the anode and the first reference electrode, between the first and second reference electrodes and between the second reference electrode and the cathode. However, Langner discloses a method of monitoring an electrolytic process in an electrolytic cell (1), which ensures a high and uniform quality of the metal deposit (col. 2, lines 39-41), comprising one anode (6a), one cathode (6d), two reference electrodes (6b and 6c) being disposed at the surface of the anode and cathode, respectively; voltmeters (AP, CP) being respectively provided for detecting the electric voltage (U_1) between the anode and the first reference electrode (see figure 2), the electric voltage (U_2) between first reference electrode and the second reference electrode, and voltage (U_3) between the at least one second reference electrode and the at least one cathode.

Art Unit: 1753

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use a second reference electrode and voltmeter, as disclosed by Langner, in the controlled-potential electroplating device of Mayer in order to determine the electric voltage between the electrodes so as to ensure a high and uniform quality of the metal deposit.

With regard to claims 3 and 4, the reference electrode (6), of the controlled-potential electroplating device of Mayer, consist of a capillary chamber containing a metal electrode. The electrolyte in the reference electrode chamber contains the same metal ions as the electrolyte in the electrodeposition bath. The capillary chamber have its opening near the wafer and terminates in close proximity to the wafer/cathode (col. 5, lines 53-57 and 63-67).

With regard to claim 5, the anode (7) and the cathode (8), as disclosed by Mayer, are paralleled and oriented horizontally (see figure 1).

With regard to claim 6, the cathode, as taught by Mayer, is a wafer substrate (col. 4, lines 32-37) and the anode is a dimensionally stable metal anode such as a platinum or titanium anode (col. 5, lines 1-6).

7. Claim 9, 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Langner as applied to claims 7 and 8 above, and further in view of Mayer et al.

With regard to claims 9 and 10, Langner discloses all of the structure, as applied above to claims 7 and 8, but fails to teach that the reference electrode is brought into contact with the surface of the anode or cathode, and that fluid is delivered by way of capillaries. However, Mayer discloses a process and apparatus for potential-controlled

Art Unit: 1753

electrodeposition of metal into small integrated circuit features (col. 1, lines 14-17) comprising a reference electrode contained in a capillary chamber flooded with electrolyte. The capillary chamber containing the copper metal electrode have its opening near the wafer and terminating in close proximity to the wafer (col. 5, lines 53-55 and 63-67). Having the electrode in a separate chamber filled with electrolyte offers several advantages such as: the reference electrode will not be contaminated by the diffusion ions from the electroplating solution into the reference electrode chamber and the reference electrode will not contaminate the bath by diffusion of ions from the reference electrode chamber into the electrodeposition bath (col. 5, lines 27-37).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use the capillary chamber, as taught by Mayer, in the electrolytic device of Langner in order to prevent the cross contamination between the electroplating solution in the cell and the reference electrode by the diffusion of ions.

With regard to claim 12, Langner discloses all of the structure, as applied above to claim 7, having wire electrodes made of copper (col. 4, lines 1-2), but fails to teach that the cathode is a wafer substrate. However, in the apparatus for controlled electroplating of Mayer, the anode (7) is typically a source of metal cations to replenish the cations of electrolyte solution (2) as they are deposited onto surface (3) of the wafer (8). The anode is a dimensionally stable metal anode such as a platinum or titanium anode (col. 5, lines 1-6) and a semiconductor wafer is used as a cathode (8) (col. 4, lines 32-37) in order to form a relatively thin metal layer on the semiconductor surface to

Art Unit: 1753

enhance its chemical properties such as, abrasion and wear resistance, corrosion protection, and lubricity, as it is well known in the art.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to use the a wafer substrate of Mayer, as a cathode, in the method of monitoring an electrolytic process of Langner in order to form a relatively thin metal layer on the semiconductor surface to enhance its chemical properties.

8. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Langner.

With regard to claim 11, Langner teaches all of the features as applied to claims 7 and 8 above, as well as the 90° tilt from horizontal (see figure 1), but if applicant were to argue a tilt between the horizontal and the vertical, the following rejection is made. It has been held that where the only difference between the prior art and the claims was the position of a part, the claimed invention is held unpatentable because shifting the position of the part would not have modified the operation of the device. *In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). In the instant case, changing the arrangement of the electrodes will not modify the operation of the electroplating apparatus.

Conclusion


9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zulmariam Mendez whose telephone number is 571-272-9805. The examiner can normally be reached on Monday-Thursday, 8:30am-5:00pm, EST.

Art Unit: 1753

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ZM 3rd


ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER